Check 43. Use case point as software size measurement.pdf

by Arta Sundjaja

Submission date: 20-May-2019 11:33AM (UTC+0700)
Submission ID: 1102563730
File name: 43._Use_case_point_as_software_size_measurement.pdf (278.27K)
Word count: 3001
Character count: 15424

Use Case Point as software size measurement with study case of Academic Information System

Safrizal[12]
[1]Computer Science department, BINUS Graduate Program – Doctor of Computer Science
Bina Nusantara University
Jakarta, Indonesia 11480
[2]Faculty of Technic, Satya Negara Indonesia University
Jakarta, Indonesia
Safrizal001@binus.ac.id

Harco Leslie Hendric Spits Warnars[1],
Ford Lumban Gaol[2], Edi Abdurachman[3]
Computer Science Department, BINUS Graduate Program – Doctor of Computer Science
Bina Nusantara University
Jakarta, Indonesia 11480
spits.hendric@binus.ac.id[1] , fgaol@binus.edu[2] ,
edia@binus.edu [3]

***Abstract*—Academic Information System at Satya Negara Indonesia university (USNI) was developed since 2008 and as major systems required for the processes of academic activities process, which support the teaching learning process activities. The Academic information system serving students carry out lectures and gain value in the form of cards in each semester of study results. In order to rebuilding this system the current system will be measured with Use Case Point (UCP) in order to help management when extend the current Academic Information System. UCP will help the management when making their decisions regarding with the development of system in term of time, people and money. Measurement software using the UCP in Academic Information Systems of Satya Negara Indonesia university has score Use Case Point (UCP) = 86.864 and categorized as small software size project which is smaller than 99.**

Keywords—Software measurement; software size; Use case point;

I. INTRODUCTION

Academic Information System is the application of web-based academic information system that can be accessed by: Head of Department, students, faculty, staff and students via the internet. In the future, this web-based application will be equipped with intelligent application such as Data warehouse [3,4] and Data mining technologies such as Attribute Oriented Induction algorithm [5,6] or AOI-HEP algorithm with ability to find frequent and similar patterns [7,8,9]. Modules for this Academic Information System are available on the website of academic information system which consist of:

- Information course schedule
- Print schedule
- Charging FRS Online
- Charging KST
- Charging Attendance
- Charging value
- Print Index Value
- Print cumulative value / transcript Value

Satya Negara Indonesia university (USNI), was born in 1989, in Jakarta, Indonesia, and in order to support the process of academic activities. The Academic online system was built in 2008 with Personal Home Pages (PHP) programming language. Academic Information System in USNI or recognized in internal institution as SIAK (in Bahasa Sistem Informasi Akademik Kemahasiswaan) continue to be developed to date, with a concomitant increase in the number of students. SIAK built with the aim to support Satya Negara Indonesia university on Academic process in order to provide maximum service to students and facilitate the teaching learning process. Academic Information System has been largely owned by the University, College, Academy. In the implementation of the implementation of Academic Information Systems, many also do a combination of manual and not completely done online[2]. Serving students resolved case by case so that students can complete courses that can be taken and the thesis as a requirement for graduation[12,13]. The diversity of the student cases there is usually a student who did equalization are: students of the Diploma continue Ke S1, or transfer students from other campuses. For that, we need to know how to measure SIAK, where the software can be measured by the length, functionality and complexity. SIAK will be measured in perspective functions just by using approaches such as Use Case Point (UCP)[10,11].

Use Case Points (UCP) is a software estimation techniques are used to estimate the size of the software in a software development project[15]. UCP is used based on the requirements of the system described in a use case, which is part of UML modeling techniques. Software size is calculated based on the elements - elements on use case taking into account technical and environmental considerations. For software projects, UCP can be used to calculate the estimated effort for a project. Model use case points (UCP) was first popularized by Gustav Karner in 1993 [1].

Use cases are fundamentally a text form, although they can be written using flow charts, sequence charts, Petri nets, or programming languages [14].The purpose of this study was to measure the university SIAK Satya Negara Indonesia with Use Case Point, where results can be used by management to determine software size, complexity and level of effort for development. In this paper, we will calculate SIAK of Satya

Negara Indonesia university using the Use-Case Points. A description and explanation of the Use-Case Point will be presented in Section 2. Section 3 will be explained in detail that we use in the measurement SIAK Satya Negara Indonesia university. In section 4, we briefly describe the analysis of the calculation results. In this section, we will SIAK analysis of the size, complexity, and effort to develop SIAK USNI. Finally, in Section 5 we present the conclusions obtained from the analysis.

II. THE THEORY ABOUT USE CASE POINT

As shown in figure 1, there are 4 steps for running Use Case point (UCP) as software size measurement in term of measurement of internal attribute in functional perspective. This UCP will be assessed to use case diagram model design which will count the number of actor and use case in that use case diagram. Next, are the detail of the 4 steps:

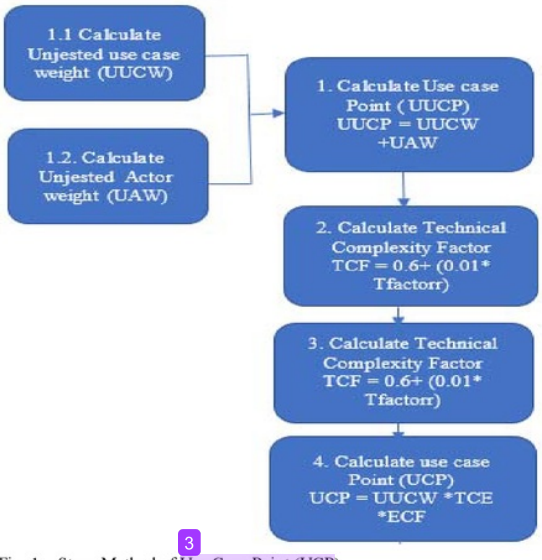

Fig. 1. Steps Method of Use Case Point (UCP)

1. Calculate Unadjusted Use Case Point (UUCP)

Calculation of Unadjusted Use Case Point (UUCP) is the 1st step which will be done based on addition of Unadjusted Use Case Weights (UUCW) and Unadjusted Actor Weights (UAW), where each of UUCW score and UAW score will be counted. Equation (1) shows the process of addition UUCW and UAW.

$$UUCP = UUCW + UAW \quad (1)$$

1.1 Calculate Unadjusted Use Case Weights (UUCW) is to determine the category of use case is simple, medium or complex. (see table 1)

TABLE I. TYPE.WEIGHT AND DESCRIPTIUON OF USE CASE

Type use case	Weight	Description Use case
Simple	5	Using ≤ 3 transactions
Average	10	Using 4 to 7 transactions
Complex	15	Using > 7 transactions

Thus, total unadjusted Use Case Weights (UUCW) is obtained from calculating how many (total) use case of each type (level of complexity) multiplied by the weight of each type.

1.2 Calculate Unadjusted Actor Weights (UAW) The first step is to determine whether the actor category as simple, medium or complex. (Table 2)

TABLE II. TYPE, WEIGHT AND DESCRIPTION OF ACTOR

Type Actor	Weight	Description Actor
Simple	1	Interacting through the API, such as Command Prompt
Medium	2	Interacting via protocols, such as TCP / IP
Complex	3	Interacting via GUI or Web Page

Thus, total unadjusted Actor Weights (UAW) is obtained from calculating how many (total) actor of each type (level of complexity) multiplied by the weight of each type.

2. Calculate Technical Complexity Factor (TCF)

The values on the Technical Complexity Factor multiplied by the respective weights, then summed to obtain Total Technical Complexity Factor (TFactor), and then used to get the value of Technical Complexity Factor (TCF). Equation (2) shows the process for TCF calculation.

$$TCF = 0.6 + (0.01 * TFactor) \quad (2)$$

3. Calculate Environmental Complexity Factor (ECF)

The values on the enviromental complexity factor multiplied by the respective weights, then summed to obtain the total Environmental Complexity Factor (EFactor), and then used to obtain the Environmental Complexity Factor (ECF). Equation (3) shows the process for ECF calculation.

$$ECF = 1.4 + (-0.03 * EFactor) \quad (3)$$

4. Calculate Use Case Point (UCP)

The values of UCP will be get from multiplication UUCW, TCF and ECF as shown in equation (4).

$$UCP = UUCP * TCF * ECF \quad (4)$$

III. APPLYING OF USE CASE POINT ON ACADEMIC INFORMATION SYSTEM (AIS) AT SATYA NEGARA INDONESI UNIVERSITY

The Use Case Point (UCP) will be assessed to academic information system (AIS) at Satya Negara Indonesia university

where the business process is shown in use diagram shown in figure 1. The use case diagram in figure 1 has 4 actors and 8 use cases.

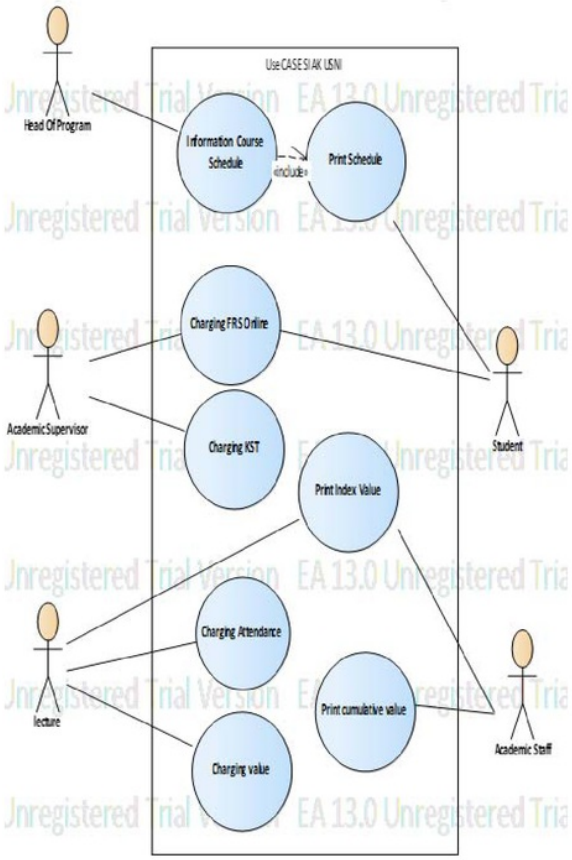

Fig. 2. Use case diagram Academic Information system at Satya Negara Indonesia university.

Next are the detail for each use case in use case diagram in figure 2:

1. Information Course schedule.
   Chairman of the Department browse through online create a schedule that contains the course, lecturers, the number of credits, days, hours and Space.
2. Print schedule.
   The schedule which had been created in previous use case process can be printed to be known by the high level management and for other purpose such as the students can see the schedule.
3. Charging FRS Online.
   FRS online charging are where students taking courses in the next semester and as the semester plan which will become to known the number of students who take the course each and how many courses should be delivered.
4. Charging KST.
   Charging is done via FRS Kst who have taken if the credits are taken less then performed additional credits and if the reduction of excess credits, based on the GPA obtained
5. Charging Attendance By Lecturer
   Charging Attendance by students and is approved by the lecturers
6. Charging Value
   Charging value by lecturers online with the validation from BAAk department or recognized as Academic and students administration department, via hardcopy printout given to the faculty and conducted by the lecturers concerned that it contains a value absent, tasks, midterm semester final exam semester
7. Print index value.
   After filling lecturer value, that value is printed by BAAK department for each half.
8. Print the cumulative value.
   Values are also printed by BAAK staff, ie if the cumulative value of the 3rd semester, printed semester 1,2, and 3 or temporary transkrips.

As mention in previous section where there are 4 steps in UCP process such as calculate UUCP (including UUCW and UAW), TCF, ECF and UCP scores. This UCP process will be applied in order to measure the software size of Academic Information System at Satya Negara Indonesia university as shown in use case diagram in figure 2.

1. Calculate Unadjusted Use Case Point (UUCP)
   1.1. Calculate Unadjusted Use Case Weights (UUCW)
   In use case diagram in figure 2 there are 8 use cases as mention before as the detail for each use case activity. Table 3 shows that there are 4 use cases as simple use case, 3 use cases as average use case and 1 use case as complex use case. All the use case category will be summed up and having UUCW score 65 as seen in table 3.

TABLE III. IDENTIFY AND WEIGHT CASE UUCW

Use Case	Category	Weight
Make a study schedule	Simple	5
Print schedule Lecture	simple	5
Charging FRS Online	Average	10
Charging KST	Average	10
Charging Attendance by Lecturer	Simple	5
Charging Value	simple	5
Print index value	Average	10
Print the cumulative value	Complex	15
Unadjested Use case Weight (UUCW)		**65**

   1.2. Calculate Unadjusted Actor Weights (UAW)
   As seen in figure 2, there are 5 Actors such as Head Of Program, Academic Supervisor, Lecturers, students and academic staff. All the actors are categorized as complex actor with score=3, since all

of them having GUI (Graphical User Interface) or website interaction. Table 4 shows the composition of these 5 actors which multiply with score 3 as complex actor score and UAW has score 15.

TABLE IV. IDENTIFY AND WEIGHT ACTOR UAW

Category	Weight	Actors	count	Weight Count
Simple	1	-		
Average	2	-		
Complex	3	-	5	15
Unadjested Actor Weight (UAW)				15

After having UUCW and UAW scores then equation (1) should be applied in order to have UUCP score by adding UUCW and UAW scores. UUCP = UUCW+UAW, UUCP = 65+15=80. Then UUCP has score 80.

2. Calculate Technical Complexity Factor (TCF)
   After having UUCP score then TCF score will be collected by giving weight and value for 13 TCF as shown in table 5 and as shown in table 5 then TFactor has score 29 as cumulative of multiplication of weight and value of thirteen TCF. TCF score will be calculated based on equation (2) where TCF= 0.6+(0.01*TFactor), TCF = 0.6 + (0.01*29), TCF = 0.6 + 0.29, TCF = 0.89. Then TCF has score 0.89.

TABLE V. CALCULATE TECHNICAL COMPLEXITY FACTOR (TCF)

No	Technical Complexity Factor	Weight	Value	Weight * Value
5	Distribused System	2	0	0
2	Response Time Is Important	1	2	2
3	End User Efficiency	1	4	4
4	Complex Internal Processing Required	1	1	1
5	Reusable Code Must Be A Focus	1	2	2
6	Installation Easy	0.5	4	2
7	Usability	0.5	4	2
8	Cross-Platform Support	2	2	4
9	Easy To Change	1	4	4
10	Highly Concurrent	1	3	3
11	Custom Security	5	3	2
12	Dependence On Third-Part Code	1	1	1
13	Dependence On Third-Part Code	1	2	2
TFactor				29

3. Calculate Environmental Complexity Factor (ECF)

TABLE VI. CALCULATE ENVIRONMENT COMPLEXITY FACTOR (ECF)

NO	Environmental Complexity Factor	Weight	Value	Weight *Value
1	Familiarity with the Project	1.5	2	3
2	Application Experience	0.5	2	1
3	OO Programming Experience	1	2	2
4	Lead Analyst Capability	0.5	2	1
5	Motivation	1	3	3
6	Stable Requirements	2	2	4
7	Part Time Staff	-1	4	-4
8	Difficult Programming Language	-1	4	-4
EFactor				6

After having TCF score then ECF score will be collected by giving weight and value for 8 ECF as shown in table 6 and as shown in table 6 then EFactor has score 6 as cumulative of multiplication of weight and value of eight ECF. ECF score will be calculated based on equation (3) where ECF= 1.4+(-0.03*EFactor), ECF = 1.4 + (-0.03*6), ECF = 1.4 + (-0.18), ECF = 1.22. Then, ECF has score 1.22.

4. Calculate Use Case Point (UCP)
   After having ECF score then the last step is finding UCP score by multiplication of UUCW, TCF and ECF as based on equation (4) where UCP = UUCP*TCF*ECF, UCP = 80*0.89*1.22 = 86.864. Then, UCP has score 86.864.

IV. CONCLUSION

The measurement of software size in Academic Information System at Satya Negara Indonesia university has score 86.864 and recognized as small project where having UCP less than 99. By the way, the UCP size of project software development is categorized become four categories and they are small project with less than 99 UCP, medium project with UCP between 100 and 299, large project with UCP between 300 and 799 and extreme project with more than 799 UCP.

The measurement of software size with UCP which deploy to use case diagram is one of software size measurement into internal attribute and specific in term of the functionality of software. Using UCP to measure the software size will help the management how to deal with the software development project where the management can predict the allocation people, time and money based on use case diagram as design model system.

REFERENCES

[1] G.Karner,Resource Estimation for Objectory Projects. Objective System SF AB, 1993.

[2] R.K. Clemmons, Project Estimation With Use Case Point. Diversified Technical Services, Inc., 2006.

[3] H.L.H.S Warnars, R. Randriatoamanana (2016), "Datawarehouser: A Data Warehouse artist who have ability to understand data warehouse schema pictures", IEEE TENCON 2016 (Technologies for Smart Nation), pp. 2207-2210, 22-25 Nov 2016, Singapore. http://site.tencon2016.focalevents.sg/

[4] H.L.H.S Warnars, (2014), "Perbandingan penggunaan Database OLTP (Online Transactional Processing) dan Data Warehouse", Creative Communication and Innovative Technology (CCIT) journal, Vol. 8 No. 1, pp. 83-100, September 2014. ISSN: 1978-8282.

[5] H.L.H.S Warnars (2015), "Mining Patterns with Attribute Oriented Induction", The International Conference on Database, Data Warehouse, Data Mining and Big Data (DDDMBD2015), Tangerang, Indonesia, pp. 11-21, 10-12 September 2015.

[6] H.L.H.S Warnars, M I Wijaya, H B Tjung, D F Xaverius, D V Hauten, Sasmoko (2016), "Easy understanding of Attribute Oriented Induction (AOI) characteristic rule algorithm", International journal of Applied Engineering Research (IJAER), vol. 11, No. 8, pp. 5369-5375. ISSN-0973-4562. Source: http://www.ripublication.com/ijaer16/ijaerv11n8_03.pdf

[7] H.L.H.S Warnars (2016), "Using Attribute Oriented Induction High level Emerging Pattern (AOI-HEP) to mine frequent patterns", International Journal of Electrical and Computer Engineering (IJECE), vol. 6, No.6 http://www.iaesjournal.com/online/index.php/IJECE/article/view/10579

[8] H.L.H.S Warnars, (2014), "Mining Frequent and Similar Patterns with Attribute Oriented Induction High Level Emerging Pattern (AOI-HEP) Data Mining Technique", International Journal of Emerging Technologies in Computational and Applied Sciences (IJETCAS), vol. 3, Issue 11, pp.266-276. EISSN : 2279-0047, ISSN: 2279-0055. Source : http://iasir.net/IJETCASpapers/IJETCAS15-247.pdf

[9] H.L.H.S Warnars (2014),"Mining Frequent Pattern with Attribute Oriented Induction High level Emerging Pattern (AOI-HEP)", IEEE the 2nd International Conference on Information and Communication Technology (IEEE ICoICT 2014), Bandung, Indonesia, pp. 144-149, 28-30 May 2014.

[10] K. Iskandar, F.L. Gaol, B. Soewito, H.L.H.S. Warnars (2016), "Software size measurement of knowledge management portal with use case point", The international conference on Computer, Control, Informatics, and its Applications (IC3INA 2016), 3-5 Oct 2016, Tangerang, Indonesia. http://situs.opi.lipi.go.id/ic3ina2016/

[11] M. Ochodek, J. Nawrocki, K. Kwarciak, Simplifying effort estimation based on Use Case Points, ul. Piotrowo 2, 60-965 Poznan´, Poland

[12] A.P. Subriadi, Sholiq, P.A. Ningrum " Critical Review Of The Effort Rate Value In Use Case Point Method For Estimating Software Development Effort" Journal of Theoretical and Applied Information Technology 31st January 2014. Vol. 59 No.3

[13] B. Anda , H. Dreiem, D. I.K. Sjøberg and M. Jørgensen, Estimating Software Development Effort based on Use Cases – Experiences from Industry

[14] A. Cockburn, Writing Effective Use Cases. Addison-Wesley. 2000.

[15] M.S. Iraji, H. Motameni, " Object Oriented Software Effort Estimate with Adaptive Neuro Fuzzy use Case Size Point (ANFUSP)" I.J. Intelligent Systems and Applications, 2012, 6, 14-24 Published Online June 2012 in MECS (http://www.mecs-press.org/)

Check 43. Use case point as software size measurement.pdf

ORIGINALITY REPORT

22%	5%	19%	16%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Dede Kurniadi, Sasmoko, Harco Leslie Hendric Spits Warnars, Ford Lumban Gaol. "Software size measurement of student information terminal with use case point", 2017 IEEE International Conference on Cybernetics and Computational Intelligence (CyberneticsCom), 2017 Publication	4%
2	Herman Bedi Agtriadi, Natalia Chandra, Harco Leslie Hendric Spits Warnars, Ford Lumban Gaol. "Software size measurement with use case point for employee application software at STT-PLN", 2017 IEEE International Conference on Cybernetics and Computational Intelligence (CyberneticsCom), 2017 Publication	4%
3	Sarwosri, Muhammad Jabir Al Haiyan, Mujahid Husein, Aditya Putra Ferza. "The development of method of the enhancement of Technical Factor (TF) and Environmental Factor (EF) to the Use Case Point (UCP) to calculate the	3%

estimation of software's effort", 2016 International Conference on Information & Communication Technology and Systems (ICTS), 2016
Publication

---

4 Karto Iskandar, Ford Lumban Gaol, Benfano Soewito, Harco Leslie Hendric Spits Warnars, Raymondus Kosala. "Software size measurement of knowledge management portal with use case point", 2016 International Conference on Computer, Control, Informatics and its Applications (IC3INA), 2016 — 3%
Publication

---

5 Submitted to Universitas Brawijaya — 3%
Student Paper

---

6 Meiliana, Syaeful Karim, Harco Leslie Hendric Spits Warnars, Ford Lumban Gaol, Edi Abdurachman, Benfano Soewito. "Software metrics for fault prediction using machine learning approaches: A literature review with PROMISE repository dataset", 2017 IEEE International Conference on Cybernetics and Computational Intelligence (CyberneticsCom), 2017 — 1%
Publication

---

7 Submitted to Greenwich School of Management — 1%
Student Paper

8	documents.mx Internet Source	1%
9	Submitted to Northcentral Student Paper	1%
10	Submitted to Binus University International Student Paper	1%
11	repobib.ubiobio.cl Internet Source	1%
12	Submitted to National University of Singapore Student Paper	1%

Exclude quotes	On	Exclude matches	< 1%
Exclude bibliography	On		